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Nursing procedures during continuous renal replacement therapies: a national survey

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ABSTRACT

Introduction: The current role of nurses in the management of critically ill patients needing continuous renal replacement therapies is clearly fundamental. The care of these complex patients is typically shared by critical care and dialysis nurses: their precise duties may vary from country to country.
Methods: To clarify this issue we conducted a national-level survey at a recent Italian course on nursing practices during continuous renal replacement therapies.
Results: A total of 119 questionnaires were analysed. The participants, who were equally divided between critical care and dialysis nurses, came from 44 different hospitals and 35 Italian cities. Overall, 23 % of participants answered that "the dialysis staff" were responsible for continuous renal replacement therapies in the Intensive Care Unit, while 39 % answered "the critical care nurse", and 38 % "a shared organization". Interestingly, less than the half of participants claimed specific continuous renal replacement therapies training was provided to employees before handling an acute dialysis machine. Finally, about 60 % of participants had experience of extra-corporeal membrane oxygenation machines used in conjunction with continuous renal replacement therapies.
Conclusions: Workload coordination and management of critically ill patients undergoing continuous renal replacement therapies in Italy is not standardized. At present, the duties of critical care and dialysis nurses vary significantly across the country. They frequently overlap or leave gaps in the assistance received by patients. The role of nurses involved in the care of continuous renal replacement therapies patients in Italy currently requires better organization, possibly starting with intensive standardized training and educational programs.

Keywords: *continuous renal replacement therapy, training, simulation, survey, extracorporeal membrane oxygenation.*

INTRODUCTION

The role of critical care nurses in the management of continuous renal replacement therapies (CRRT) in Intensive Care Units (ICU) is currently a matter of debate (1). Many centres have applied a collaborative approach, where nurses from the dialysis unit (DU) intervene during a CRRT session, generally to take care of the technical aspects of the dialytic treatment (2). Other centres recommend that ICU nurses have complete control over CRRT management (3). Although some controversial literature was published on the subject (4), it must be acknowledged that the intervention of

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nurses from the DU allows for a high level of specific expertise as far as the technical and clinical aspects of dialysis are concerned. Furthermore, when organized this way, the increased workload on the critically ill patient undergoing continuous dialysis is shared by two bedside healthcare providers. However, an adequately trained ICU employee might begin the treatment in a more timely manner and proceed to the dialysis machines without any delay (hypothetically, that is, due to the "on call" nature of the schedule).

This may have a positive effect on dialysis timings and costs, as well as increasing the responsibilities and duties of critical care nurses at the bedside.

The problem currently dividing Italian hospital administrators and nurse coordinators is that no general rule has ever been recommended for CRRT in the ICU. It is unclear whether different approaches should be applied at different levels of care, or if a standardized method might be suggested in the future, or if each centre should be able to take decisions based on local resources.

The aim of this study was to better clarify the issue of nursing organization for CRRT in the ICU: in order to address this issue, a national-level survey was conducted.

METHODS

A survey was carried out of people attending a course on nursing practices during CRRT. A questionnaire was made freely and widely available, and participants were invited to complete it. The questionnaires were anonymous and optional. They focussed on specific issues regarding practice patterns in the field of critical care nephrology and consisted of six demographic inquiries and 15 multiple choice questions, divided into four sections as follows:

1) information about the participants' background and working environment;
2) specific questions regarding several aspects of nursing organization;
3) specific aspects of CRRT management, such as the hypothetical presence of another device (i.e. extracorporeal membrane oxygenation (ECMO)) or CRRT delivered to children;
4) an open-answer question about the most frequent problems encountered during CRRT.

Statistical Analysis. All documents were analysed using a Microsoft Excel database, where the working group entered the information received. All data are presented as absolute numbers and/or as percentages.

RESULTS

Of the 130 participants attending the meeting, 120 filled out the questionnaire (92%). In one case, this was considered inadequate (less than 50% of answers completed). Consequently, 119 questionnaires were analysed (114 nurses, 2 medical doctors, and 3 dialysis technicians). Participants came from 44 different hospitals and 35 Italian cities. Sixty-nine responders (58%) were healthcare providers working in DUs, and the remaining 50 (42%) were nurses operating in ICUs. Most of the participants worked in an adult setting, but 47 (39%) stated that they had paediatric expertise. More than half (66; 56%) had over ten years' experience, and only 22 (19%) were "young" workers with less than 5 years' experience. The remainder (25%) had between 5 and 10 years' experience. Ninety-one (77%) of the participants stated that in their hospital the average number of acute dialytic treatments was below 10 per month. Of these, about one third came from low-volume centres delivering less than one treatment per month.

The second part of the questionnaire concerned nursing organization. To the ques-

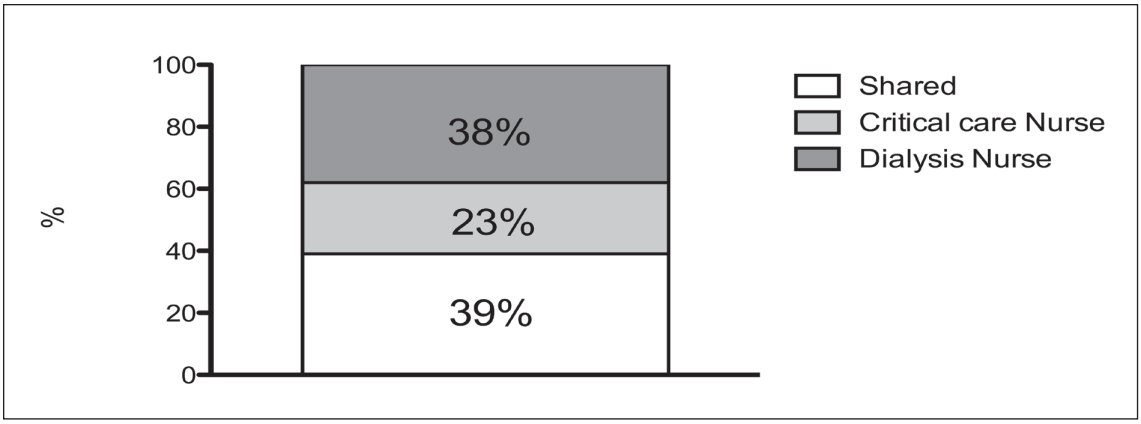

Figure 1 - *CRRT management: the answer to the question "who is in charge, in your Institution, for CRRT management", was in 27 (23%) cases "the dialysis staff", in 46 (39%) cases "the critical care nurse" and in 45 (38%) cases "a shared organization".*
CRRT = continuous renal replacement therapies.

tion "Who is in charge of CRRT management in your institution?" 27 (23%) answered "the dialysis staff", 46 (39%) "the critical care nurse", and 45 (38%) "a shared organization" (*Figure 1*).
According to 63% of respondents, workload generally increased when CRRT commenced. However, 25% did not consider their shifts to be made more demanding by CRRT (71% of this subgroup came from high-volume institutions). The remaining 12% (all coming from nephrology units) stated that collaboration between critical care nurses and dialysis nurses implies a correct balance in the healthcare workload.
Only 50% of the participants stated that specific training was provided for CRRT management, while 45% stated that they had never attended any dedicated training and had gained their expertise in the course of their work. The remainder (5%) had never received any CRRT training. An analysis of theoretical and technical CRRT training by specialty area revealed that 62% of operators working in nephrology and dialysis departments had received training, whereas only 34% of critical care nurses had attended a CRRT training program. Regarding professional requirements for managing CRRT patients, 22% answered that only trained personnel could handle critically ill patients. However, this percentage was largely made up of nephrology nurses. Contrastingly, only 2% of critical care nurses believed this requirement to be essential for their unit. In 49% of cases, both trained and untrained nurses were allowed to manage CRRT, whereas 30% stated that trained personnel were required to supervise those who had not received any training.
To the question of whether a professional operator was required to set up the CRRT machine after prescription was made on the clinical chart, 75% confirmed that this was done by the medical staff (30% by an intensivist, 45% by a nephrologist). Interestingly, 21% stated that the dialysis nurse was allowed to set up the machine following medical prescription on the clinical chart.
Regarding who was in charge of patients' connection to CRRT, 71% stated that this was the dialysis nurse, in 13% of cases the duty fell to the critical care nurse, and in

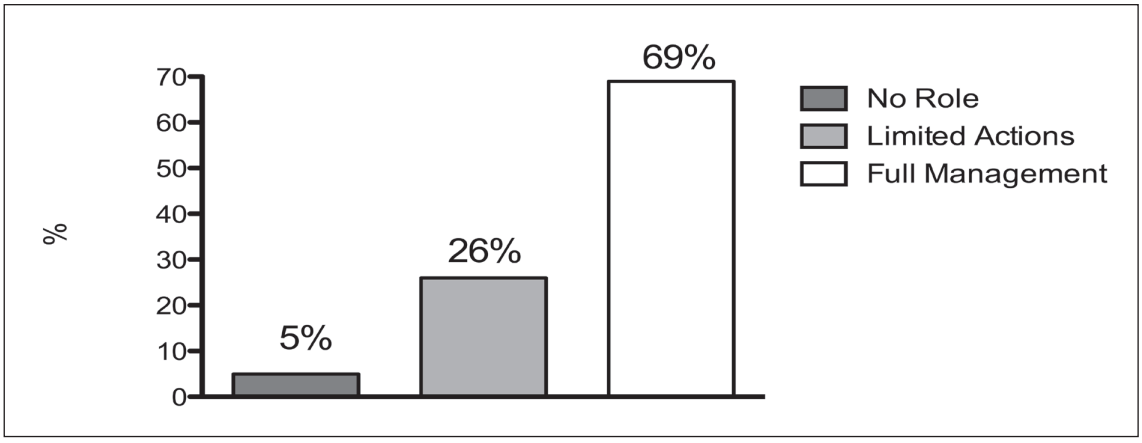

Figure 2 - *Nurses roles on technical aspects of dialysis machines: 69% of people answered that the nurse in charge with the CRRT patient is responsible for circuit management and should be able to understand all technical aspects of CRRT sessions. However 26% of responders claimed that nurses should be involved only in basic functions management (bag changes, alarms silencing and overriding) and 5% of respondents surprisingly claimed that no role is due to nurses during a CRRT session.*
CRRT = continuous renal replacement therapies.

16% it was the intensivist. Analysis of the subgroup of critical care nurses revealed that the intensivist was in charge of patient connection in 40% of cases. There were no instances of the nephrologist connecting CRRT at the start of the session.

To the question of who was responsible for managing and overriding CRRT alarms, 50% answered that the role was shared between dialysis and ICU staff. However, 35% answered that the critical care nurse was independently responsible for alarm management and troubleshooting. Only 16% of respondents identified the dialysis nurse as the main operator. Clearly, this answer was influenced by the professional affiliation of the respondents. When dialysis and critical care subgroups were analysed individually, it was revealed that 65% and 66%, respectively, were assigned to alarm management.

When the nurses' roles were analysed in detail, 69% answered that the nurse in charge of the CRRT patient was responsible for circuit management and should be able to understand all technical aspects of CRRT sessions (*Figure 2*) and 25% of respondents claimed that nurses should only be in charge of basic functions (bag changes, alarms silencing and overriding) (*Figure 2*).

The third part of the survey was dedicated to particular CRRT set ups and settings. Participants were asked if ECMO treatments were performed in their unit, and 60% of participants (86% of critical nurses) claimed to have experience in ECMO. Overall, 50% of respondents had connected a CRRT patient to an ECMO machine (87% of critical nurses and 17% of dialysis nurses). A perfusion nurse was present and shared patient workload in 50% of cases when a CRRT patient was connected to an ECMO machine. Interestingly, regarding the question of who should be in charge of such a complex procedure (ECMO + CRRT), 26% answered, "I do not know", and 43% answered that the critical care nurse should be in charge (this increased to 77% in the subgroup of crit-

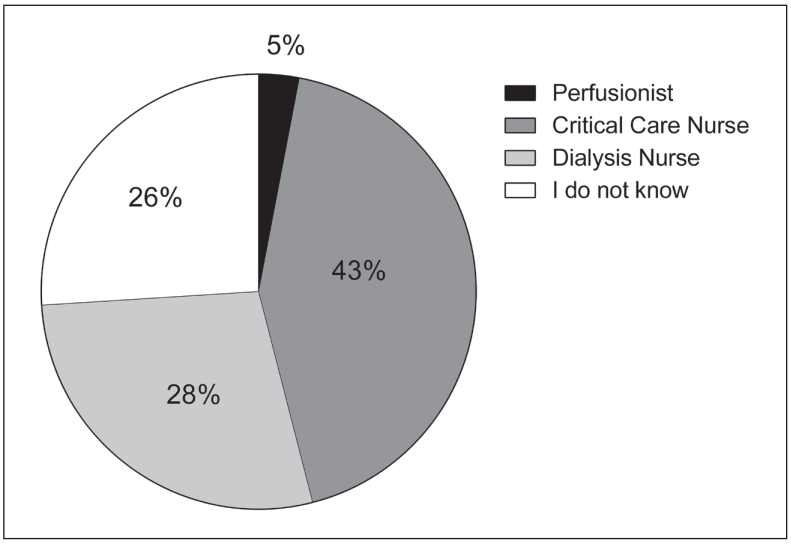

Figure 3 - *Nursing roles in case of ECMO+CRRT: 26% of responders answered "I do not know", 43% answered that the critical care nurse should be managing such a case and the remaining 21% answered that the dialysis nurse should be responsible for CRRT managing also in this kind of patients.*
CRRT = continuous renal replacement therapies; ECMO = extracorporeal membrane oxygenation.

ical care nurses). The remaining 21% answered that the dialysis nurse should be responsible for managing CRRT under these circumstances (*Figure 3*).
The last part of the questionnaire concerned the most frequent problems encountered by participants during their everyday practice involving CRRT. Lack of adequate training was the most important issue for 31%. A need for greater collaboration among operators during a CRRT session was cited by 24%. The remainder made negative mention of workloads or frequent technical problems encountered during the majority of CRRT sessions.

DISCUSSION

The main finding of this study was that In Italy no standardized protocol exists on CRRT nursing management in the ICU: one third of centers apply a collaborative approach, where nurses from DU and from ICU share the CRRT workload, in one third of cases the critical care nurses are fully in charge for CRRT management and in the remaining centers only DU staff manages CRRT in the ICU.

In spite of the great developments in critical care nephrology, and an increase in dialytic indications in ICUs worldwide (5), several issues remain controversial (6). These include the fact that no recommendation is currently in place regarding who should indicate, prescribe, start, deliver and manage CRRT (2).
In the last decade, intensivists and nephrologists have begun to collaborate on clinical aspects of critical dialysis. However, it is only recently that they have started to develop a common language (7), and the multidisciplinary approaches of clinicians involved in the care of severe acute kidney injury may vary significantly from institution to institution. What clearly emerges from our survey is that nursing management and coordination in Italy requires significant optimization.
One of the most important lessons learned from this questionnaire is that the responsibility for CRRT in the ICU differs significantly according to the institution. Another interesting observation concerns the substantial lack of standardized training for clinical staff involved with CRRT patients. It appears that half of employees handling

CRRT machines have never received any specific training. It might be argued that in a high-intensity setting such as this, nurses cannot necessarily receive training for every device that they use. In our opinion, however, CRRT machines have become part of routine ICU equipment, and as such merit specialist knowledge for their use (8). This would improve critical care and dialysis nurse coordination, and optimize the organization of CRRT management. With the exception of alarms management, it is clear that a well-trained nurse would be able to handle every aspect of a CRRT session (priming, connection, troubleshooting, circuit maintenance and, probably, modification of settings based on prescribed dose) (9). It has been recently shown that specific training also improves circuits' patency and reduces avoidable errors during CRRT troubleshooting (4).

Finally, it is a fact that extracorporeal treatments are becoming more and more complex, and that ECMO treatments are less infrequent, especially in high-volume centres (10). In light of this, the multidisciplinary approach is fundamental. Multiple skills involving different healthcare professionals - including the perfusionist, who is often in charge of the ECMO device - are required for treating CRRT patients. The application of a CRRT machine to an ECMO patient (including the potential connection of CRRT to ECMO) requires specific protocols, knowledge, training and collaboration. As such, the indications arising from this survey should be given serious consideration.

In partial confirmation of this observation, the vast majority of nurses complained about the lack of coordination, regardless of the type of organization employed by their hospital. In our opinion, this relates to every part of CRRT management, including knowledge of the basics, troubleshooting simulation, and manual training in the management of machines operating at the bedside (9).

A plausible solution to the issue of CRRT handling might be the provision of similar basic training to all healthcare professionals including advanced programs with simulation. If critical care and dialysis nurses were all able to provide the same assistance to CRRT patients, their cooperation might be significantly easier and the distribution of responsibilities less strict (11, 12).

Finally, an optimized application of competences acquired by healthcare professionals would significantly reduce the cost of increased staffing for patients undergoing CRRT and likely improve technical management, reduce errors and optimize average circuit lifespan.

Limitations

As participants in the same course, the respondents may represent a self-selected population, causing a significant bias to the overall results and their interpretation. Furthermore, the sample size was not particularly large.

However, based on the authors' experience, the results confirmed existing (if unverified) knowledge about CRRT practice in Italy. Furthermore, while the participants came from a large number of centres, an uncertain number of Italian centres was unrepresented by the respondents. However it is unlikely, in these authors opinion, that the inclusion of some unrepresented institution would have significantly changed our findings.

CONCLUSION

According to the results of this small survey, the role of Italian nurses in the treatment of CRRT patients is not standardized and requires significant modification. At present, established duties for critical care and dialysis nurses vary significantly across

the country. These duties frequently overlap or leave gaps in patient assistance. It is possible that intensive standardized training and educational programs may help resolve this issue.

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